# Alleviating Disability and Unmet Need: Differential Dimensions addressed by Assistive Technology and Personal Care

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## ABSTRACT

### Alleviating Disability and Unmet Need: Differential Dimensions addressed by Assistive Technology and Personal Care

*Purpose*. To examine differences in reports of residual disability and unmet need by type of care arrangement (assistive technology and/or personal care) amongst disabled adults.

*Method*. This study compares three specific dimensions of residual difficulty (pain, fatigue, and time intensity) and unmet need for hands-on care across combinations of assistive technology and personal care. Analyses are conducted on samples of between 3,493 to 7,051 persons with limitations in bathing, transferring, walking, and getting outside from the U.S. 1994-95 National Health Interview Survey Phase 2 Disability Supplements.

*Results*. Even accounting for differences in underlying disability, equipment use confers no additional benefit in the three dimensions of residual difficulty analysed here. Equipment users equally or more often report that tasks are tiring or time consuming, or painful even when they use assistance. Though this would appear to indicate unmet needs for care, fewer equipment users report a desire for hands on personal care.

*Conclusions*. We find that disability alleviation by technology is no better on specific dimensions of difficulty, but technology users report less unmet need for personal care. Designing appropriate and cost-effective home care for disabled adults depends upon an understanding of the ways in which technology users may differ from others and the circumstances in which technology can be most effective.

## INTRODUCTION

Designing appropriate and cost-effective home care for disabled adults is a priority in aging societies. In the U.S., for example, the number of disabled adults is large and continues to grow, despite reductions in disability rates amongst older adults in the last two decades (Schoeni, Freedman and Wallace, 2001). Currently about 15% of the adult U.S. population, or 40 million people, are limited in activities due to a chronic health condition (Kaye, LaPlante, Carlson and Wenger, 1996). The vast majority of disabled adults live in the community, and facilitating the ability of disabled adults to live independently is an increasingly important public health concern.

Most disabled adults use some kind of assistive device, most often to assist with mobility (Russell et al, 1997), and the number has been growing over time, especially amongst the elderly (Manton, et al. 1993; Russell et al, 1997). Yet, the relative advantages of assistive technology and personal care are not well understood, in part because most studies evaluate one or the other, but rarely the two together.

Most research on assistive technology evaluates the efficacy and costs of specific pieces of equipment (Chen, et al. 1998; Mann, et al. 1996; Sanford, Arch and Megrew, 1995; Steinfeld and Shea, 1995; Kohn, LeBlanc, and Mortola, 1994; Gitlin and Levine, 1992), or broadly examine the use of any assistive devices (Manton, 1993; Zimmer and Chappell, 1994; Norburn, et al., 1995; Mann, 1998) or the number of devices used (Hartke, et al., 1998; van der Heide, et al., 1993; Mann, et al. 1993). Studies of assistive technology emphasise the extent to which the acceptability and effectiveness of home-based technologies vary depending upon the training provided (Gitlin and Levine, 1992; Gitlin et al., 1993), the amount of stigma perceived by the patient (Arras, 1995), and how

much the introduction of equipment transforms the home from a personal space to a health care delivery location (Tamm, 1999). Similarly, population-based efforts to understand the effectiveness of personal care arrangements often exclude altogether a consideration of self-care through assistive technology (Allen and Mor, 1997; Desai, Lentzner, and Weeks, 2001; Tennstedt, McKinlay, and Kasten, 1994). These studies instead focus on the tradeoffs between formal and informal care or on the extent to which formal care can defer institutionalisation (Soldo and Freedman, 1994)

Attempts to measure outcomes that reflect the quality of interventions for disability are relatively new and differ depending upon whether the goal is to evaluate rehabilitation services specifically or more general effects on the ability to live independently (Andresen, et al., 2000). A recent U.S. national study examined the effectiveness of assistive technology in terms of its impact on hours of personal care for disabled elderly, assuming that the decision to use devices is independent of the acquisition of caregivers (Allen, 2001). This study found that those who use assistive technology also use fewer hours of personal care. Two additional small-scale experiments have evaluated the effectiveness of interventions to increase the use of assistive devices (Mann, et al, 1999) and environmental modifications for dementia (Gitlin, et al. 2001). Although sample sizes were small, both studies suggest that increased use of technology may slow functional declines, lower health care costs, and increase efficacy among some caregivers. However, none of these studies directly compare the impacts of assistive technology and personal care on functional health. Two other nationally representative U.S. studies have evaluated the relative effectiveness of equipment and personal care in terms of reported reduction of disability (Verbrugge, et al. 1997; Agree, 1999). Using different measures and data, these studies

found that the use of assistive technology was associated with greater reduction of difficulty in either ADLs or mobility impairments.

Prior research has either failed to compare directly outcomes related to assistive technology and personal care, begging the question as to when and whether each is most appropriately used (Hoenig, Allen, Mann 99, Gitlin 2001), or relied upon *global* assessments of residual difficulty that do not offer insights into the *mechanisms* by which different care arrangements alleviate needs (Verbrugge, Agree). For example, equipment may alleviate difficulty by minimising the pain associated with a task, whereas personal care may lessen the time and energy necessary to accomplish a task.

The purpose of this study is to further investigate the relative effectiveness of assistive technology and personal care in alleviating disability amongst adults with difficulty in the activities of daily living (ADLs). Using nationally representative disability survey data from the U.S., we compare three dimensions of disability for which both underlying and residual difficulty can be assessed—pain, fatigue, and time intensity—across different combinations of equipment and personal care use. We also examine reports of the need for hands-on assistance across care arrangements.

## METHODS

**Data.** Data are from the 1994 and 1995 Phase 2 Disability Supplements to the U.S. National Health Interview Survey, hereafter referred to as the NHIS-D2 (National Center for Health Statistics, 1998a; 1998b). These data provide detailed information on the use of assistive devices and environmental modifications for limitations in activities of daily living (ADL).

The U.S. National Health Interview Survey is a nationally representative health survey of about 48,000 households (122,000 persons) conducted annually by the U.S. National Center for Health Statistics. The survey consists of a core questionnaire that collects health information and demographic background on every person in the household. Each year supplemental surveys on specific health topics are included. In 1994 and 1995, a Supplement on Disability was administered in two phases over approximately three years. Phase 1, administered at the same time as the NHIS core interview, collected basic measures of impairment and functional health from a designated individual about all household members.

Household members who were identified as disabled in Phase 1, using a broad definition of disability (the presence of any impairment, functional limitation, or disability), were interviewed in person 7-17 months later to obtain more detailed information (Phase 2). Separate questionnaires were administered to the child (under 18) and adult (age 18 and older) samples. Response rates were about 95 percent for the core and 87 percent for the supplements.

**Sample selection.** In order to examine the effectiveness of care arrangements in alleviating disability, we focus on the population with *underlying* limitations in the Activities of Daily Living (ADLs), those who report that they have difficulty carrying out an activity by themselves and without special equipment. This definition includes both persons currently using some form of care as well as a substantial number who report difficulty but make use of no personal care or equipment. We further refine our analyses to include adults aged 25 and older. We exclude children because the underlying causes and disability trajectories of the very young differ from those experienced by adults and

because the instruments used to collect information and reporting procedures differed for the child and adult samples.

Because assistive devices tend to be task-specific in response to disabling conditions (Agree and Freedman, 2000), analyses are conducted separately for samples reporting underlying difficulty with each of four daily activities: bathing or showering (n=3,493), getting in/out of bed or chairs (n=3,834), walking (n=7,051), and getting outside (n=3,542). Although respondents also were asked about difficulty with dressing, eating, and getting to/using the toilet, sample sizes were too small, and the use of equipment too rare in the case of dressing and eating, to analyse care arrangements for these activities. Respondents with multiple ADL difficulties may be in more than one sample.

**Measures of equipment and help.** For each ADL respondents were asked whether they used any special equipment or aids for each activity, and if so to name them. Interviewers checked off all of the equipment mentioned against a pre-selected list. Respondents also were asked whether they received hands-on help from another person with that activity. For each ADL, information was obtained on the type and intensity of personal care provided to the respondent. Based on this information, we classified respondents into four groups: 1) no care, 2) equipment only, 3) hands-on help only, and 4) both hands-on help and equipment.

**Level of underlying difficulty**. Comparing the effectiveness of care arrangements requires some ability to control for the differential selection of these arrangements based on the severity of underlying disability. We therefore stratify our analyses by level of underlying difficulty when making comparisons across care arrangements. For each

activity, respondents were classified as having some difficulty, a lot of difficulty, or being completely unable to carry out the activity without help or assistance[1].

**Measures of effectiveness.** The NHIS-D2 provides task-specific measures of residual difficulty and unmet need. The survey included information on three explicit dimensions of residual difficulty. For each activity, respondents (with the exception of those who were completely unable to perform the task) were asked if the activity is 'very tiring'; 'takes a long time' or is 'very painful' both *without* personal care and/or equipment, and also *with* help and/or equipment if used. This information was used to classify whether a respondents' difficulty with an activity was 'eliminated' when using help and/or equipment or whether they report residual difficulty even when using assistance.

All respondents reporting underlying difficulty with a given task were asked whether they needed (more) hands-on help with the activity as a measure of unmet need.

**Hypotheses.** Based on previous research, we expect that technology will be more effective than personal care in alleviating disability. Consequently we hypothesize that, controlling for the level of underlying need, those who use assistive devices are a) less likely than those using personal care to report residual difficulty on all dimensions of disability, and b) less likely than those using personal care to report unmet need for personal care.

**Methods.** Because the NHIS-D2 is not a random sample but instead has a complex design with geographic clustering, statistical tests have been adjusted to take into account the complex survey design. All estimates are weighted with analytic weights normed to

3. For some analyses, those who are completely unable are excluded from the sample, as they were not asked about specific dimensions of difficulty (tiring, painful, time-consuming).

the appropriate sample size. Results discussed in the text are statistically significant at the $p<.05$ level unless otherwise noted.

## RESULTS

Table 1 shows the percentage distribution of care used for each of the four activities of daily living, stratified by the severity of underlying disability. Assistive device use is quite common for all of the activities considered here. Between 16% (of persons with difficulty transferring) and 39% (of those who have difficulty walking) use equipment alone to accommodate their difficulty (see Table 1). An additional 13 to 33 percent use assistive technology in combination with personal care. Taken together, from 29 to 64 percent use one or more devices, with equipment dominating most clearly in basic mobility activities (walking and going outside).

[Table 1 about here.]

Table 1 also confirms that the combination of care adopted is clearly related to the overall amount of underlying difficulty with the task. Looking down each of the columns within activity and type of assistance, shows that those who use no care of any kind are the least disabled, with between 66% and 79% reporting only 'some' difficulty, compared with only between 11% and 20% of those using both help and equipment. Conversely, from 1.3% (transferring) to 6.9%(going outside) of those using no assistance report they are completely unable to conduct the activity, compared with between 48 and 60 percent of those using both help and equipment.

Amongst those who do use some type of assistance, those who use equipment by itself report more moderate levels of underlying difficulty compared with those who use

hands-on help (alone or in combination with equipment). Only 13 to 20% of those who use equipment alone state that they would be unable to perform the task without help, compared with 26-43% of those depending on personal care alone. As noted above, those who rely upon both personal care and equipment report the greatest amount of difficulty, with 50-60% reporting that they would be completely unable to perform the task without assistance.

Table 2 shows the proportion reporting each specific dimension of difficulty by activity and underlying level of severity on the global disability indicator[2]. Amongst those who say they are able to carry out activities without assistance, substantial numbers (from 47-76% depending on the specific task), find a given activity tiring, time consuming, or painful when they do not use help or equipment. Not surprisingly, the proportions reporting difficulty on each of the specific dimensions are consistently higher amongst those reporting 'a lot' of difficulty on the global indicator, ranging from 59 to 88 percent across activities.

[Table 2 about here.]

The proportion reporting difficulty on each of the three specific dimensions also varies across care arrangements. Those using both personal care and assistive technology are generally more likely than those using either one alone to report that a task is very tiring, takes a long time, or is very painful when carried out without assistance. However, when stratified by level of underlying difficulty on the global disability indicator, this relationship is attenuated. As shown in the bottom panel of Table 2, amongst those reporting ‘a lot of difficulty’ on the global measure, the type of care arrangement chosen is

[2] Those who reported that they were entirely unable to perform an activity were excluded from the questions on specific dimensions, and are consequently not included in this table.

more weakly related to the probability of reporting difficulty on each of the three specific dimensions, and several of the associations are non-significant.

The next table turns to reports of residual difficulty, using the three specific dimensions of difficulty (whether the task is tiring, time consuming, or painful) controlling for the global level of underlying difficulty. This table shows that those who use equipment alone report residual difficulty more often than those using help (with or without equipment) though this relationship is significant only for two dimensions (whether the task is tiring or time consuming) and three of the tasks in the table (see top panel of Table 3). Pain varies the least across care arrangements and is not significantly related to the type of care for any of the activities. These findings are consistent when stratified by the global level of underlying difficulty with the activity (see bottom panel of Table 3).

[Table 3 about here.]

For many activities and dimensions of difficulty, especially pain, care arrangements are not significantly related to residual difficulty. However, in those cases where a significant association is found, it is opposite to the expected direction—equipment users more often report that a task is tiring or takes a long time even when using assistance.

Figure 1 shows the proportion reporting that a need for hands-on help by activity and level of underlying severity of disability. In general the proportions reporting a need for (more) hands-on help is quite low and consistent across levels of underlying disability and types of care (the highest levels are 12-18% reported by those with ‘a lot’ of underlying difficulty and who use personal care alone).

[Figure 1 about here.]

However, those using equipment alone are consistently less likely to state that they need any hands-on help, at levels as low or lower than for those who use no care. For bathing, levels of unmet need are highest, but the differences across types of care are minimal and not significant. For the three mobility-related ADLs, the differences between those who use personal care (either alone or in combination with equipment) and those who do not (using either equipment alone or no care at all) are substantial and consistently significant across levels of disability.

## DISCUSSION

Facilitating the independence of disabled adults to live and work independently in the community is a central goal for rehabilitation scientists and public health practitioners. One of the most important avenues for research in this regard is on the use of assistive technology. Equipment is the most common means of managing day to day tasks for adults. However, how assistive technology and personal care are combined is closely related to the amount of difficulty reported, with less disabled persons more likely to use devices alone, and the most disabled using a combination of assistive technology and personal care. This relationship is true both when underlying difficulty is measured with a global indicator and also for three specific dimensions of difficulty (whether a task is tiring, time consuming or painful).

However, though disabled adults using only equipment tend to be less disabled than users of personal care, they more often report residual difficulty for two of the specific dimensions of difficulty (whether a task is tiring or time consuming) for all activities and most levels of disability. Pain varies the least across care arrangements and does not

appear to be significantly related to type of care for the mobility activities of walking and going outside. For those activities and dimensions where the relationships are not significant, however, the prevalence of residual difficulty is still higher amongst those using only assistive technology to meet their needs. These findings would appear to indicate that equipment is less effective than personal care in alleviating disability, but users of assistive technology also are much less likely to report a need for any hands-on help than those already using personal care.

Though it is difficult, at best, to quantify outcomes that indicate optimal care arrangements (Eldar, 2000), these results expand upon our understanding of the effectiveness of assistive technology and personal care. Using global measures of difficulty prior research (Verbrugge, Agree) found that equipment appeared to be more effective than personal care in reducing or eliminating disability. When we examine residual difficulty on the three specific dimensions in these data we find instead that equipment appears to be no different or less effective than personal care in eliminating difficulty with ADL tasks. The results for unmet need as a measure of effectiveness, however, agree with our initial hypothesis—those using equipment alone are much less likely to state that they need hands-on care.

These findings do not contradict the earlier work, but rather inform it, by expanding our definition of effectiveness to include three specific dimensions of difficulty and reports of unmet need, and also by considering the effectiveness of both technology and personal care jointly. Our results imply that disabled adults who use equipment alone, especially at more advanced levels of disability, are unique in a several ways:

First, the selection of more disabled persons into care arrangements that include hands-on personal care must be taken into account in any examination of effectiveness. In general, those with greater amounts of difficulty are less likely than those with only moderate problems to have their difficulty completely eliminated by any form of care. Agree (1999) showed that the effectiveness of equipment used alone decreased as levels of impairment increased. Our findings suggest that differences in personal care and assistive technology, at least on specific dimensions, diminish at higher levels of disability, but we are limited in our assessment of this relationship because the NHIS-D excludes the most severely disabled (those who report that they are unable to perform a task without assistance) from questions that would allow an assessment of the adequacy of their care arrangement.

Second, the sensitivity of a measure to clinically detectable differences in functional status is an important factor in comparing across types of care (Cohen and Marino, 2000). Either *reduction* or *elimination* of difficulty can be used to assess effectiveness. In this study it was necessary to examine effectiveness only in terms of the *elimination* of difficulty, whereas previous studies (Verbrugge, 1997; Agree 1999) examined *reduction* as well. There are many reasons that equipment, which requires some physical and cognitive effort to use, might reduce overall difficulty more easily than personal care, but not completely eliminate it, especially on the dimensions addressed in this paper. For example, using a walker may enable someone with arthritis to get outside more often, thus increasing personal independence and reducing the disabling effects of the disease on his or her ability to conduct the activities of daily life. However, the physical

effort of using a walker may mean that the task is no less painful, tiring, or time consuming.

Third, the finding that equipment users less often report a need for hands-on help despite greater residual difficulty, illustrates the likelihood that factors other than the severity of underlying disability influence the choice of care arrangements and must be attended to in both research and clinical practice. In particular, the use of assistive technology may be related to psychological factors such as receptivity, self-efficacy, and motivation, all of which have been shown to be related to the success of rehabilitative efforts (Zimmer and Chappell, 1999; Arnstein, 2000; Grahn, EkDahl and Borquist, 2000). Values related to autonomy and privacy also are important aspects of the acceptance and use of technology in rehabilitation and home care (Tamm, 1999).

Finally, we need to explore additional dimensions of disability in order to understand the circumstances under which equipment and personal care are most effective. The variation of our results across ADLs indicates that further research is needed to explore the distinctions between effectiveness on a global level and in specific dimensions of disability. Whether general or specific, indicators such as residual disability and unmet need do not in and of themselves allow us to identify the reasons that a particular care arrangement is more or less satisfactory. They do, however, make it possible to uncover circumstances in which types of care are less than optimal (Eldar, 2000). The present study suggests a need to probe more deeply into the salient dimensions of disability that assistive technology and personal care alleviate. First, exploratory qualitative research needs to be done with disabled persons using all forms of care to identify the most important dimensions related to the effectiveness of different care arrangements. In one of

the few studies to address this question, Albrecht and Devlieger (1999) report that pain and fatigue are amongst the most common problems reported, but further work illuminating the nature and meaning of these dimensions is warranted.

Our findings also have implications for the conceptualisation and measurement of unmet need. Studies of unmet need have traditionally focused on personal care (Allen and Mor, 1997; Desai, et al, 2001; Tennstedt, et al., 1994), finding, as we did here, quite low reported levels of unmet need, even amongst highly disabled adults. Such research may be missing a substantial amount of unmet need for assistance, were the concept more broadly defined to include needs for and use of assistive technology. Not only may there be unmet needs that can be better fulfilled by technology rather than personal care, but the findings from this study suggest that some proportion of the disabled population may have unmet needs but would not report a desire for personal care. Mann, et al. (1995) reported that persons with arthritis expressed a need for additional devices even describing new technologies to be invented. Including specific questions about the need for additional devices to patient assessments and survey instruments would contribute a great deal to our understanding of and interventions to reduce unmet needs.

Also important is the task specific nature of assistance, not only in the type of help needed, but also in the acceptability and usefulness of care. Our results show that the type of care chosen varies by activity, and similarity in patterns of effectiveness across mobility related tasks, but these distinctions may vary by other factors, as well. For example, more educated persons express greater receptivity to technological solutions in the home, but also express less need (Zimmer and Chappell, 1999); and women may consider autonomy

in tasks such as meal preparation and household chores of more importance than do men (Tamm, 1999).

In summary, this research suggests that the use of assistive technology may not be a universal solution to future long term care needs amongst the disabled population, because, although several prior studies (Mann 99. Gitlin 2001, Verbrugge, Agree) have shown benefits from assistive technology, we find that it is equally or less effective than personal care in eliminating difficulty with ADL tasks on three specific measures. However, we do find that device users are less likely than others to desire hands on help. Our findings suggest that more work needs to be done to investigate from both a clinical and a public health perspective, the optimal use of equipment and personal assistance in home care to maximise the independence and reduce unmet needs of the disabled population in the future.

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**Table 1. Percentage Using each Type of Care Arrangement and Reporting Underlying Difficulty on the Global Indicator by Type of Assistance and Activity (Denominators in Parentheses)**

| | Type of Assistance | | | | |
|---|---|---|---|---|---|
| **Activity** | **No help or equipment** | **Equipment only** | **Help only** | **Help and equipment** | **Total** |
| **Bathing (N=3493)*** | **25.8%** | **20.5%** | **24.6%** | **29.2%** | **100.0%** |
| Some difficulty* | 71.1% | 46.9% | 34.3% | 17.0% | |
| A lot of difficulty* | 23.4% | 32.4% | 22.5% | 23.8% | |
| Completely unable* | 5.6% | 20.7% | 43.2% | 59.2% | |
| Total | 100.0% | 100.0% | 100.0% | 100.0% | |
| **Transferring (N=3834)*** | **50.1%** | **15.9%** | **20.6%** | **13.4%** | **100.0%** |
| Some difficulty* | 78.8% | 50.0% | 48.8% | 20.1% | |
| A lot of difficulty* | 19.9% | 37.1% | 24.4% | 29.2% | |
| Completely unable* | 1.3% | 13.0% | 26.8% | 50.7% | |
| Total | 100.0% | 100.0% | 100.0% | 100.0% | |
| **Walking (N=7051)*** | **40.0%** | **39.2%** | **6.3%** | **14.5%** | **100.0%** |
| Some difficulty* | 66.0% | 39.7% | 39.3% | 15.7% | |
| A lot of difficulty* | 29.7% | 41.3% | 34.7% | 36.7% | |
| Completely unable* | 4.2% | 19.1% | 26.0% | 47.6% | |
| Total | 100.0% | 100.0% | 100.0% | 100.0% | |
| **Getting outside (N=3542)*** | **23.3%** | **31.0%** | **13.1%** | **32.7%** | **100.0%** |
| Some difficulty* | 66.0% | 37.5% | 28.1% | 11.3% | |
| A lot of difficulty* | 27.1% | 37.1% | 30.7% | 30.8% | |
| Completely unable* | 6.9% | 25.4% | 41.3% | 58.0% | |
| Total | 100.0% | 100.0% | 100.0% | 100.0% | |

* $\chi^2$ test significant at $p < .05$

**Table 2. Percentage Reporting Underlying Difficulty by Dimension and Type of Assistance (Denominators in Parentheses)**

| Activity | Type of Assistance | | | | |
|---|---|---|---|---|---|
| | **ALL** | **No help or equipment** | **Equipment only** | **Help only** | **Help and equipment** |
| | **ALL WITH DIFFICULTY** | | | | |
| **Bathing** (N=1898) | | | | | |
| Very tiring* | **62.6** | 55.5 | 63.3 | 65.8 | 79.9 |
| Long time* | **62.3** | 53.7 | 62.2 | 71.9 | 76.4 |
| Very painful* | **46.6** | 44.8 | 41.6 | 52.1 | 53.2 |
| **Transferring** (N=3054) | | | | | |
| Very tiring* | **48.8** | 41.1 | 60.1 | 58.1 | 73.8 |
| Long time* | **56.9** | 49.1 | 67.1 | 67.9 | 79.8 |
| Very painful* | **67.2** | 64.2 | 68.2 | 77.2 | 65.9 |
| **Walking** (N=5172) | | | | | |
| Very tiring* | **76.4** | 72.1 | 79.5 | 83.0 | 86.9 |
| Long time* | **73.9** | 66.9 | 79.8 | 83.4 | 88.1 |
| Very painful$^{ns}$ | **66.9** | 67.4 | 66.0 | 62.7 | 70.8 |
| **Getting outside** (N=1778) | | | | | |
| Very tiring* | **72.4** | 63.5 | 76.5 | 71.2 | 89.6 |
| Long time* | **72.3** | 62.4 | 78.8 | 71.4 | 86.9 |
| Very painful$^{ns}$ | **63.2** | 61.7 | 66.0 | 58.0 | 65.5 |
| | **THOSE WITH "A LOT" OF DIFFICULTY** | | | | |
| **Bathing** (N=623) | | | | | |
| Very tiring$^{ns}$ | **80.8** | 79.8 | 79.8 | 81.5 | 83.5 |
| Long time$^{+}$ | **80.7** | 73.5 | 82.8 | 86.5 | 84.2 |
| Very painful$^{ns}$ | **59.1** | 62.9 | 49.8 | 62.2 | 63.4 |
| **Transferring** (N=811) | | | | | |
| Very tiring* | **71.6** | 62.8 | 78.4 | 79.9 | 79.6 |
| Long time* | **78.4** | 72.3 | 80.4 | 86.0 | 85.5 |
| Very painful* | **81.0** | 81.2 | 83.2 | 86.0 | 68.2 |
| **Walking** (N=2059) | | | | | |
| Very tiring$^{+}$ | **87.9** | 85.9 | 89.2 | 84.4 | 91.7 |
| Long time* | **87.8** | 83.5 | 91.1 | 86.1 | 91.5 |
| Very painful$^{ns}$ | **78.4** | 80.6 | 77.5 | 69.5 | 78.4 |
| **Getting outside** (N=719) | | | | | |
| Very tiring* | **85.5** | 80.8 | 86.4 | 80.7 | 92.5 |
| Long time* | **87.4** | 81.8 | 93.6 | 76.2 | 90.8 |
| Very painful$^{ns}$ | **73.7** | 75.5 | 75.1 | 65.9 | 73.4 |

***** $\chi^2$ test significant at $p < .05$; $^{+}$ $\chi^2$ test significant at $p < .10$ ; $^{ns}$ $\chi^2$ test not significant ( $p > .10$)

**Table 3. Percentage Reporting Residual Difficulty by Dimension and Type of Assistance (Denominators in Parentheses)**

| | Type of Assistance | | |
|---|---|---|---|
| | **Equipment Only** | **Help Only** | **Help and Equipment** |
| | **ALL WITH DIFFICULTY** | | |
| **Bathing** | | | |
| Very Tiring* | 74.9% (N=239) | 55.1% (N=253) | 66.0% (N=203) |
| Long Time* | 83.0% (N=232) | 49.4% (N=284) | 62.8% (N=193) |
| Very painful[ns] | 70.2% (N=164) | 62.5% (N=194) | 67.0% (N=132) |
| **Transferring** | | | |
| Very Tiring* | 70.1% (N=228) | 56.0% (N=328) | 59.3% (N=138) |
| Long Time* | 76.2% (N=259) | 57.0% (N=378) | 57.3% (N=148) |
| Very painful[ns] | 82.4% (N=256) | 79.1% (N=419) | 76.9% (N=126) |
| **Walking** | | | |
| Very Tiring[ns] | 80.1% (N=1298) | 77.0% (N=245) | 76.6% (N=334) |
| Long Time[ns] | 83.0% (N=1305) | 78.9% (N=249) | 78.5% (N=338) |
| Very painful[ns] | 82.1% (N=1075) | 79.7% (N=185) | 83.0% (N=271) |
| **Getting Outside** | | | |
| Very Tiring* | 86.7% (N=387) | 78.2% (N=145) | 77.2% (N=228) |
| Long Time* | 88.9% (N=398) | 76.0% (N=147) | 79.3% (N=221) |
| Very painful[ns] | 86.9% (N=331) | 85.7% (N=120) | 79.7% (N=166) |
| | **THOSE WITH "A LOT" OF DIFFICULTY** | | |
| **Bathing** | | | |
| Very Tiring* | 76.3% (N=115) | 60.2% (N=93) | 70.3% (N=109) |
| Long Time* | 85.7% (N=120) | 60.9% (N=102) | 64.0% (N=110) |
| Very painful[ns] | 70.7% (N=73) | 71.7% (N=69) | 68.8% (N=80) |
| **Transferring** | | | |
| Very Tiring[ns] | 75.1% (N=109) | 68.6% (N=144) | 66.5% (N=73) |
| Long Time[ns] | 78.7% (N=117) | 72.1% (N=152) | 63.7% (N=81) |
| Very painful[ns] | 87.6% (N=117) | 88.4% (N=153) | 84.9% (N=66) |
| **Walking** | | | |
| Very Tiring[ns] | 85.4% (N=664) | 87.1% (N=111) | 82.7% (N=234) |
| Long Time[ns] | 87.2% (N=682) | 86.6% (N=116) | 85.8% (N=231) |
| Very painful[ns] | 85.1% (N=580) | 87.0% (N=93) | 86.1% (N=197) |
| **Getting Outside** | | | |
| Very Tiring[ns] | 90.7% (N=195) | 87.2% (N=70) | 84.3% (N=145) |
| Long Time[ns] | 87.5% (N=211) | 85.3% (N=68) | 85.1% (N=140) |
| Very painful[ns] | 86.3% (N=172) | 85.6% (N=59) | 83.5% (N=115) |

***** $\chi^2$ test significant at $p < .05$

**ns** $\chi^2$ test not significant ( $p > .10$)

**Figure 1. Percentage Reporting an Unmet Need for Hands-on Care by Type of Assistance and Activity**